



Figure 1

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| | Opcode | SrcReg2 | SrcReg1 | Condition | Direction | subpeode | | | | Width | Target |
|-----|--------|---------|---------|-----------|-----------|----------|---|----|---|-------|--------|
| ADD | 0x02 | r2 | r1 | c | f | e1 | 1 | e2 | 0 | d | t |

Figure 2

| | Opcode | Condition | Direction | subopeode | Width |
|--------------------|--------|-----------|-----------|-----------|-------|
| ADD R1,R2,R5 | 0x02 | 0 | 0 | 0x18 | 0 |
| ADD, < *R1,R2, R5 | 0x02 | 1 | 1 | 0x18 | 1 |
| ADD, C, R1, R2, R5 | 0x02 | 0 | 0 | 0x1c | 0 |
| ADD, L*R1, R2, R5 | 0x02 | 0 | 0 | 0x28 | 1 |

Figure 3

```

.proc template _ADD_L_EQ
magic_04540      ::
Template_ADD_L_EQ  ::
{
.mii
                (p0) add    P.A_t    = PA_r1 ,PA_r2  ;; // INSTR1
                (p0)      PT,pF    = r0      ,PA_t    ;; // INSTR2
                cmp4.eq
                Nop.i                                ;; // INSTR3
}
.endp
template_ADD_L_EQ

```

Figure 4

```
// To deposit bits 20:25 from a 32 bit Pa -RISC instruction "pa_instr", into bits 10:15 in 41 bit
// Itanium instruction "ia_instr":

((struct {u64 pad1:48;u64 f:6; u64 pad 2:10} *) &ia_instr) ->f =
((struct {u32 pad1: 13;u32 f:6; u32 pad 2:21} *) & pa_instr)->f
```

Figure 5

```
// Instr 1:  (p0)add          PA_t      =  PA_r1      ,  PA_r2
// Instr 2:  (p0)emp4.eq      p7,p6     =  r0         ,  PA_t
```

1. Add WAW edge between nodes (last_producer[PA_t], Instr 1)
2. Add RAW edge between nodes (last_producer[PA_r1], Instr 1)
3. Add RAW edge between nodes (last_producer[PA_r2], Instr 1)
4. Add RAW edge between nodes (last_producer[qualifying -predicate], Instr 1)
5. Update Instr 1 as last_producer [PA_t]
6. Update Instr 1 as live_user [PA_t], live_user[PA_r1] and live_user [PA_r2]
7. Update miscellaneous information about Instr 1 (viz. Instr unction type, issue type, latency info etc). for use by scheduler at runtime.

*// using the static invariant that there is a RAW dependency
// between Instr 1, Instr 2 on PA_t*

8. add Raw edge between nodes (Instr 1, Instr 2)
9. Add RAW edge between nodes (last -producer[qualifying -predicate], Inst 2)
10. Add WAW edge between nodes (last -producer[p6, Instr 2)
11. Add WAW edge between nodes (last -producer[p7], Instr 2)
12. Update Instr 2 as last_producer[p6], and last_producer [p7]
13. Update Instr 2 as live_user [PA_t]
14. Update miscellaneous information about Instr 2 (viz. Instruction type, issue type, latency info etc.) for use by scheduler at runtime.

Figure 6

| Name | PA-RISC Instructions Translated | Without Templates | | With Templates | | Translation Speedup |
|---------------|---------------------------------------|--|--|--|--|------------------------|
| | | CPU Cycles Overhead (in million) | CPU Cycles per PA Instruction | CUP Cycles Overhead (in million) | CPU Cycles per PA Instruction | |
| Netscape | 1139954 | 1208 | 1060 | 232 | 204 | 25.19 |
| Acroread | 4427072 | 2190 | 579 | 549 | 126 | 4.55 |
| Java-Version | 21600959 | 314 | 145 | 571 | 26 | 5.50 |
| _200_check | 36295360 | 2855 | 78 | 547 | 14 | 5.27 |
| _201_Compress | 59032516 | 57197 | 968 | 12715 | 215 | 4.49 |
| Gzip | 132250 | 125 | 949 | 22 | 172 | 5.51 |
| Tar | 160691 | 176 | 925 | 33 | 176 | 5.23 |
| Ghostview | 534737 | 690 | 1291 | 120 | 224 | 5.74 |
| Gcc | 1343130 | 2085 | 1553 | 571 | 425 | 3.65 |
| Parser | 148075 | 251 | 1701 | 54 | 368 | 4.61 |

Figure 7

| Application | Time in Secs w/o Templates | Time in Secs with Templates | Overall Speedup Factor |
|----------------|-------------------------------|--------------------------------|---------------------------|
| Netscape | 2.57 | 0.58 | 4.37 |
| Acrobat | 17.33 | 5.90 | 2.80 |
| Java – version | 34.29 | 5.89 | 5.82 |
| _200_check | 10.224 | 3.903 | 2.61 |
| _202_jess | 380.241 | 126.833 | 2.99 |
| _209_db | 1040.341 | 145.379 | 7.15 |
| _213_javac | 2602.306 | 822.393 | 3.16 |
| _227_mtrt | 452.022 | 111.609 | 4.11 |
| Gzip | 2.57 | 4.11 | 0.62 |
| Tar | 1.26 | 1.04 | 1.24 |
| Ghostview | 5.64 | 3.2 | 1.76 |
| Gcc | 474 | 614 | 0.77 |
| Parser | 1217 | 1228 | 1.00 |

Figure 8